

CARDIOVASCULAR DISEASE RISK FACTORS AND PHYSICAL FITNESS OF PAMI ATHLETES IN MALANG CITY

Hartati Eko Wardani¹, Tika Dwi Tama², Laras Putri Gamagitta³,
Zirroh Alin Zariroh², Mishella Putri Novitalia¹, Suni Rohana¹,
Rio Hidayanto Pratama¹ and Erni Astutik³

¹Department of Medicine, Faculty of Medicine, ²Department of Public Health, Faculty of Sport Science, Universitas Negeri Malang, Malang, Indonesia;
³Department of Epidemiology, Faculty of Public Health, Airlangga University, Surabaya, Indonesia

Abstract. Cardiovascular disease poses a concern to athletes that cannot be ignored. There are still significant costs and a limited service time involved in screening athletes for cardiovascular disease. Athletes are frequently subjected to sudden cardiac death (SCD). Additionally, fitness is another predictor of mortality in adult male athletes. It is essential to test athletes for cardiovascular disease by assessing their physical condition as well as numerous risk factors. In the City of Malang, there is a group of amateur and professional athletes aged over 40 years old called PAMI. The purpose of this study was to identify the cardiovascular disease risk factors and physical fitness of PAMI Malang athletes. The cross sectional, quantitative descriptive investigation was carried out. This study covered all athletes over the age of 40 who had no prior history of heart disease. As many as 34 participants were recruited purposively. Smoking history, physical activity, blood pressure, stress level, body mass index, and blood glucose data were for cardiovascular risk factors, and maximal oxygen consumption (VO_2 max) was used to determine fitness level. The Multi-stage Fitness Test (MSFT) was utilized to evaluate VO_2 max, while the Perceived Stress Scale (PSS) and Global Physical Activity Questionnaire (GPAQ) were employed to measure stress levels and physical activity levels, respectively. The findings revealed that while the majority of respondents had normal blood glucose levels, no history of smoking, moderate to medium levels of stress, and high levels of physical activity, nobody had normal blood pressure, and the majority of athletes had high body mass indices.

Keywords: physical activity, athlete, cardiovascular disease, physical fitness, sudden cardiac death

Correspondence: Hartati Eko Wardani, Department of Medicine, Faculty of Medicine, Universitas Negeri Malang, Jl. Semarang No. 5, Malang, East Java, Indonesia
Tel: +62 341 551312 E-mail: hartati.eko.fk@um.ac.id

INTRODUCTION

Non-communicable diseases (NCDs) have grown more common throughout the world. This illness accounts for 41 million annual deaths, or 74% of all fatalities worldwide (WHO, 2023). Eighty-six percent of all NCD-related deaths take place in low- and middle-income nations (WHO EMRO, n.d.). Cardiovascular disease is responsible for over 35% of NCD-related fatalities worldwide (WHO, 2023). Heart and blood artery dysfunction lead to cardiovascular disease (CVD), a disorder. Examples of this type of illness include heart failure, hypertension, stroke, and coronary artery disease (WHO/ISH, 2007).

East Java Province has a slightly higher prevalence of cardiovascular disease than the national average, ie the prevalence of cardiovascular disease in East Java was 1.7% while it was 1.5% nationwide (Indonesian Ministry of Health, 2019). Although there are more and more young individuals suffering from CVD, the bulk of cases occur in those over 40 years old, specifically those between the ages of 55-64 (3.9%) and 65-74 (4.6%), as well as 74 years of age or older (4.7%) (Indonesian Ministry of Health, 2019). This is reasonable sense given that a person's ability to function normally in terms of their heart and blood arteries declines as they age. According to Tyrrell and Goldstein (2021), aging accelerates atherogenesis through decreasing blood vessel mitochondrial function and increasing interleukin 6 release in the aorta.

According to a study on risk factors for adults over 40 in Malang Regency, 6,455 individuals (29.2%) had a high risk of CVD such as coronary heart disease and atherosclerosis (Wahyuni *et al*, 2022). Referring to the 2020 Malang Regency Death Survey, there were 18,130 deaths due to NCDs in Malang; 3,460 cases (19.1%) of heart disease and 3,142 cases (17.3%) of stroke accounting (Health Departement of Malang Regency, 2022). High blood sugar, blood lipids, blood pressure, and obesity are the intermediate risk factors for CVD that are increased by unhealthy lifestyle choices such food, sedentary behavior, and smoking. It has been established that ceasing up smoking, consuming less salt in meals, engaging in regular physical activity, and eating a lot of fruits and vegetables all lead to good health (WHO/ISH, 2007)

Exercise is like a two-edged sword; while it has many well-known benefits for health, it can also increase the risk of sudden cardiac death (SCD) in people who have a history of previously undiagnosed CVD. SCD occurs in 1/100,000 to 3/100,000 athletes per year among competitive athletes aged under 35 (Börjesson, 2014). Although uncommon, SCD has significant emotional problems. Both professional and amateur athletes are susceptible to SCD. Hypertrophic and arrhythmogenic cardiomyopathy are among the causes of SCD. Athletes with these two diseases frequently exhibit no symptoms or are asymptomatic (Robles *et al*, 2022). The causes of sudden death in athletes who compete account for about 56% of fatalities, with the rest of them coming from heat stroke, lung diseases, severe trauma, and drug usage. Exercise does not itself result in heart problems, but in athletes with compromised cardiovascular health, it accelerates SCD. Compared to non-athletes, athletes who regularly engage in very high intensity exercise have a 2.5 to 4.5 times higher risk of developing SCD (Hajduczuk *et al*, 2022). Younger people are more likely to have cardiomyopathies, channelopathies, and

congenital defects of the coronary arteries. The most frequent cause of sudden cardiac mortality and sudden cardiac arrest in elderly people is atherosclerotic coronary artery disease (Han *et al*, 2023).

Athletes' physical fitness will be impacted by the state of their heart and blood vessels. In male adults, fitness is linked to coronary heart disease and may even be a predictor of death (Gander *et al*, 2015; Laukkanen *et al*, 2001). Therefore, it is crucial to evaluate sportsmen for cardiovascular disease, especially those who are over 40. Sports medical evaluations (SME), also referred to as cardiovascular disease screening in athletes, can be performed on both professional and amateur or recreational athletes. Sports medical evaluations (SME) consists of a physical examination, a medical history review, and coronary electrocardiography both at rest and during exercise (Braber *et al*, 2015). Not all athletes can do medical evaluations because it takes a lot of effort and cash. Therefore, it is necessary to test the risk of cardiovascular disease in an easier and more affordable way, which can be done by ordinary people.

Applying the World Health Organization and the International Society of Hypertension' risk prediction chart is one method for determining a person's level of cardiovascular risk (WHO/ISH, 2007). A number of research in Indonesia have employed the WHO/ISH Chart, a color diagram that is particularly simple to apply to a larger community (Maharani *et al*, 2019; Mukhtar *et al*, 2021; Septiani *et al*, 2018). Using data on individual risk factors such age, gender, systolic blood pressure, smoking status, history of diabetes mellitus, and blood cholesterol levels, the overall risk level for cardiovascular disease should be determined. This graph, known as the risk prediction diagram for Region B Southeast Asia, can be used for 14 WHO subregions, one of which is the Indonesian region (SEAR B).

One of the numerous communities of athletes in Malang who frequently exercise is (Persatuan Atletik Master Indonesia /Indonesian Masters Athletic Association) (PAMI). PAMI brings together athletes over the age of 40 to practice regularly, three to four times each week. Some of them are competitive athletes who still take part in various competition events. The remainder are merely amateur athletes that train collectively on a regular basis. Due to the perception that they do not need to undergo regular health checks which are costly or time-consuming, the risk of those athletes for getting certain non-communicable diseases, including sudden cardiac death, increase. The risk is not detected early.

The purpose of this study was to evaluate the cardiovascular risk and fitness of PAMI athletes. The findings of this study would serve as a model for future research, such as for determining the training model based on the condition of the athlete's health risk factors in Malang and other Indonesian cities. Therefore, athletes can control their CVD risk factors and avoid worrying about sudden cardiac death when exercising by using the appropriate training approach.

MATERIALS AND METHODS

Study design and setting

This quantitative descriptive cross-sectional study was conducted from July to August 2023 at Universitas Negeri Malang, Malang, Indonesia.

Study participants

The population in this study were all athletes who registered as members of PAMI Malang City in 2023, amounted to 40 athletes. Sample

selection was carried out purposively. Inclusion criteria were age above 40, no prior history of heart disease, and willingness to participate in the survey as demonstrated by signing an informed consent form. Athletes who had foot injuries were excluded from this study.

Study tools and data collection

Baseline data such as whether they were professional or recreational athletes, age, gender, level of education, occupation, history of heart disease, and smoking status were collected by the questionnaire filled out by the respondents. Stress level were measured using the Perceived Stress Scale (PSS) (Cohen *et al*, 1983) while the physical activity were measured using the Global Physical Activity Questionnaire (GPAQ) (WHO, 2021). After that, the respondents had their blood pressure and blood glucose checked. Body mass index (BMI) was calculated by dividing body weight in kg by height in square meters. It is categorized as normal when the BMI ranges 18.5-22.9 kg/m²; overweight when BMI ranges 23-29.9 kg/m²; and obese when the BMI is >29.9 kg/m². Omron Digital Personal Scale HN289 (Omron Healthcare Manufacturing Vietnam Co Ltd, Thu Dau Mot, Vietnam) was used to measure weight and Seca 222 Stadiometer (Seca, Hamburg, Germany) was used to measure height. A random blood glucose was measured by using Easy Touch GCU (Bioptik Technology Inc, Miaoli, Taiwan). Blood glucose level is considered normal when it is below 200 mg/dl. The blood pressure is classified based on the Joint National Committee on Prevention Detection, Evaluation, and Treatment or High Pressure VII (JNC VII) (US Department of Health and Human Services, 2004). The measurement was conducted by using Omron Automatic Blood Pressure HEM-7120 (Omron Healthcare Manufacturing Vietnam Co Ltd, Thu Dau Mot, Vietnam).

VO₂ max was measured to evaluate fitness levels using the Multi-stage Fitness Test (MSFT) (Leger and Lambert, 1982). The Multistage Fitness Test (MFT) is commonly referred to as the Bleep Test. It is a 20-meter run marked with cones where athletes will run according to the bleeping sound of the music played during the test. The number of levels and shuttles was converted into VO₂ max values then categorized based on gender and age variables. Cardiovascular fitness levels are categorized into six categories: very poor, poor, moderate, good, excellent, and very good) (Leger and Lambert, 1982).

The Perceived Stress Scale (PSS) was used to measure the stress levels (Cohen *et al*, 1983). The PSS questionnaire consists of 10 questions. This questionnaire consists of 10 questions where 'never' is given a score of 0, 'almost never' is given a score of 1, 'sometimes' is given a score of 2, 'quite often' is given a score of 3, and 'very often' is given a score of 4. Level of stress is assessed by summing the score of each question. If the respondent receives a score between 0 and 13, they are considered to be under mild stress; if they get a score between 14 and 25, they are considered to be under moderate stress; and if they acquire a score between 27 and 40, they are considered to be under severe stress (Cohen *et al*, 1983).

The Global Physical Activity Questionnaire (GPAQ) was used to measure stress levels and physical activity levels (WHO, 2021). Metabolic equivalents (MET) were calculated to analyze the GPAQ data. MET <600 is classified as having low physical activity, MET 600 to 3000 is considered as moderate physical activity, and ≥3000 is high physical activity (WHO, 2021).

Data management and analysis

All of the variables measured are described in the data tabular

format and pie chart by Microsoft Excel (Microsoft Corporation, Redmond, WA). The CVD risk was calculated using the WHO/ISH Risk Prediction Chart for the South-East Asia B sub-region (SEAR B) (WHO/ISH, 2007). There are two sets of risk prediction charts that have been developed by WHO/ISH: with and without blood cholesterol. Data regarding sex (male/female), age (measured in single years), systolic blood pressure (in mmHg), total serum cholesterol (in mmol/l), current smoking status (yes/no) and diabetes status (yes/no) are needed to utilize the former charts. The total risk of CVD over 10 years was classified into four risk categories: <10% risk value was considered as 'low risk', 10% to <20% risk value as 'moderate risk', 20% to <30% risk value as 'high risk', and $\geq 30\%$ risk value as 'very high risk' (WHO/ISH, 2007)

Ethical statement

The Faculty of Dentistry, Airlangga University, Surabaya, granted ethical approval for this study with number: 927/HRECC.FODM/VIII/2023.

RESULTS

There were 34 respondents who met the criteria as a research sample; their characteristics are listed in Table 1.

The majority of PAMI athletes who participated in the study were elderly (67.65%) or aged between 60-74 years old. Most of the participating athletes in the study were female (58.82%). Respondents were dominated by high school graduates and undergraduates. Most are retirees and housewives. Of the 34 respondents, there were 12 respondents who were professional athletes. Among these professional

Table 1
 Characteristics of the respondents (N = 34)

Characteristic	Frequency* n (%)
Age group	
Pre-elderly (<60 years old)	11 (32.35)
Elderly (>60 years old)	23 (67.65)
Average age, mean \pm SD (range)	61.12 \pm 7.02 (43-71)
Gender	
Male	20 (58.82)
Female	14 (41.18)
Level of education	
Low (elementary school graduate)	2 (5.88)
Intermediate (high school graduate)	17 (50.00)
High (undergraduate/postgraduate)	15 (44.12)
Occupation	
Civil sector	5 (14.71)
Pensionary	10 (29.41)
Housewife	9 (26.47)
Private sector	8 (23.53)
Freelance	2 (5.88)
Type of athlete	
Professional athlete	12 (35.29)
Recreational athlete	22 (64.71)

*Unless otherwise stated

SD: standard deviation

athletes, 3 were runners (25.00%), 2 were athletic athletes (16.67), 2 were javelin throwers (16.67%), 3 were soccer players (25.00%), 1 was boxer (8.33%), and 1 was discus thrower (8.33%).

Cardiovascular disease risk of PAMI athletes

Cardiovascular risk factors taken from research participants (Table 2) were smoking history, physical activity level, blood pressure, stress level, glucose level, and body mass index.

Most of the respondents in this study did not have a history of smoking (76.47%). Twenty-three respondents (67.65%) had a high physical activity level, ie having a metabolic equivalent (MET) of more than 3,001 based on the results of GPAQ responses.

Respondent had a systolic blood pressure (SBP) with an average of 149.06 ± 21.07 mmHg (ranged from 113-195 mmHg), while the average diastolic blood pressure (DBP) was 88.50 ± 13.15 mmHg (ranged from 63-125 mmHg). Twenty respondents (58.82%) have high blood pressure or classified as pre-hypertension (SBP = 120-139 mmHg and DBP = 80-89 mmHg). In addition, 9 respondents (26.47%) had grade 1 hypertension category, and 5 respondents (14.7%) had grade 2 hypertension category.

According to the PSS measurement, 19 respondents (55.88%) had moderate stress level, while 15 respondents (44.12%) had low stress levels.

Thirty-one respondents (91.18%) had normal blood sugar levels and 3 respondents (8.82%) had a hyperglycemia.

In term of body mass index, 11 respondents (32.35%) were categorized as normal, 8 (23.53%) were overweight and 15 (44.12%) were obese.

Table 2
Risk of cardiovascular disease (N =34)

Risk factor	Frequency* <i>n</i> (%)
Smoking history	
Yes	8 (23.53)
No	26 (76.47)
Physical activity level	
Low (0<MET<599)	3 (8.82)
Medium (600<MET<3,000)	8 (23.53)
High (3,001<MET<10,000)	23 (67.65)
Blood pressure	
Normal	0 (0.00)
Pre-hypertension	20 (58.82)
Grade 1 hypertension	9 (26.47)
Grade 2 hypertension	5 (14.71)
Average SBP, mean \pm SD (range) (mmHg)	149.06 \pm 21.07 (113-195)
Average DBP, mean \pm SD (range) (mmHg)	88.50 \pm 13.15 (63-125)
Stress level	
Low	15 (44.12)
Medium	19 (55.88)
High	0 (0.00)
Blood glucose level	
Normal	31 (91.18)
Hyperglycemia	3 (8.82)
Average blood glucose level, mean \pm SD (range) (mg/dl)	128.50 \pm 57.30 (53-358)

Table 2 (cont)

Risk factor	Frequency* <i>n</i> (%)
Body mass index	
Normal	11 (32.35)
Overweight	8 (23.53)
Obese	15 (44.12)
Average body mass index, mean \pm SD (range) (kg/m^2)	24.79 \pm 2.95 (31.2-19.6)

*Unless otherwise stated

Blood pressure is considered normal when SBP is <120 mmHg and DBP <80 mmHg and pre-hypertension when SBP is between 120-139 mmHg or DBP is between 80-89 mmHg. In addition, Grade 1 hypertension refers to SBP between 140-159 mmHg or DBP between 90-99 mmHg while Grade 2 hypertension refers to SBP more than equal to 160 mmHg or DBP more than equal to 100 mmHg. Stress level is considered low when respondents scored between 0 and 13; medium when score is between 14 and 25; high when scored between 27 and 40.

Blood glucose is considered normal when it is less than 200 mg/dl and hyperglycemia when it is more than equal to 200 mg/dl.

Body mass index is considered normal when it ranges between 18.5-22.9 kg/m^2 ; overweight when 23-29.9 kg/m^2 ; obese when >29.9 kg/m^2 .

DBP: diastolic blood pressure; kg/m^2 : kilograms per square meter; MET: metabolic equivalent task; mg/dl: milligrams per deciliter; mmHg: millimeters of mercury (hydrargyrum); SBP: systolic blood pressure; SD: standard deviation

Measurement of cardiovascular risk using WHO/ISH Charts showed that 25 respondents (75.53%) had a low level of cardiovascular risk and 6 respondents (17.65%) had a moderate level of cardiovascular risk. There were 2 respondents (4.88%) with a high level of cardiovascular risk and 1 respondent (2.94%) with a very high level of cardiovascular risk (Fig 1).

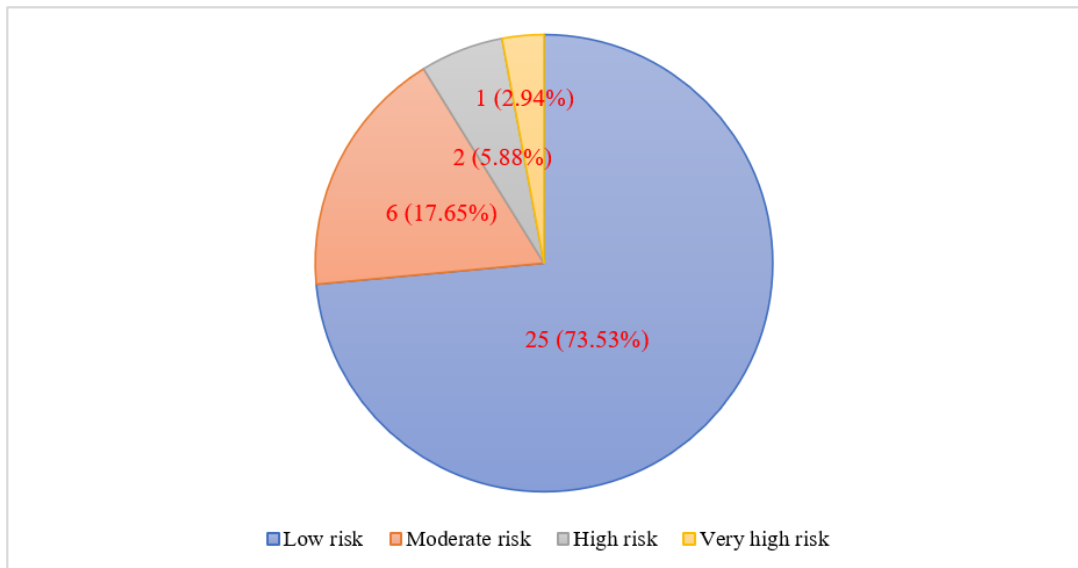


Fig 1 - Risk level of cardiovascular disease

Note: The 10-year total risk of cardiovascular disease is classified into four risk categories.

Risk is considered low when the intersection of all variables (diabetic status, gender, age, smoking status, blood pressure, cholesterol) falls in green area of the WHO/ISH risk assessment SEAR B chart (risk level <10%); moderate when such intersection falls in yellow area (risk level ranges between 10 to less than 20%); high when such intersection falls in orange area (risk level ranges between 20 to less than 30%); and very high risk when such intersection falls in red area (risk level \geq 30%) (WHO/ISH, 2007).

Cardiovascular fitness level of PAMI athlete

The results of athlete fitness estimations using MSFT to calculate VO_2 Max conditions are shown in Fig 2. It shows that at least 20 respondents (58.82%) had a moderate level of fitness. Poor fitness level respondents made up 8 respondents (23.53%), good fitness level respondents made up 4 respondents (11.76%), and very good fitness level respondents made up 2 respondents (5.88%).

DISCUSSION

All respondents involved in this research were over 40 years old, with the oldest at 71 years old. Aging lessens the performance of the cardiovascular systems organs. Cardiovascular disease risk will increase if it is not balanced with regular exercise. Exercise may improve older people's body composition, including their body fat percentage, bone health, muscular mass, endurance, and strength. Because regular exercise can lower the risk of cardiovascular disease and other age-related disorders, exercise is crucial for older persons (Rodgers *et al*, 2019).

Cardiovascular disease is more common in older women than in younger ones (Garcia *et al*, 2016). Sex hormone levels will decline as people age, with women following menopause experiencing a particularly sharp decline (Rodgers *et al*, 2019). Menopausal women who have a decline in estrogen will experience an increase in cardiovascular risk of 2-4 times, which is related to high LDL levels, hypertension, diabetes, and obesity (Silberstein, 1997). Men who have reduced testosterone levels after the age of 30 experience a similar problem. Low testosterone levels in elderly men are linked to an increased risk of stroke and mortality from cardiovascular causes (Rodgers *et al*, 2019).

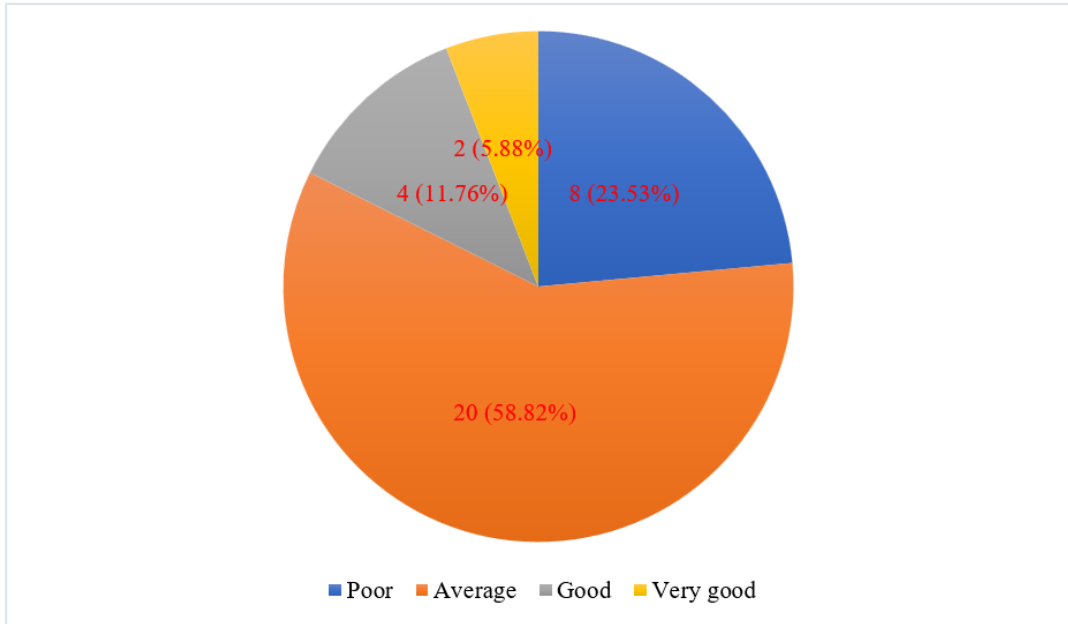


Fig 2 - Cardiovascular fitness level of PAMI athlete

For men, the cardiovascular fitness is considered poor if the fitness percentage value for those aged 40-49 years ranges between 30.2-33.5 or between 26.1-30.9 for those aged 50-59; moderate if the fitness percentage value for those aged 40-49 years ranges between 33.6-38.9 or between 31.1-34.7 for those aged 50-59; good if the fitness percentage value for those aged 40-49 years ranges between 39.0-43.7 or between 35.8-40.9 for those aged 50-59; and very good if the fitness percentage value for those aged 40-49 years ranges between 43.8-48.0 or between 41.0-45.3 for those aged 50-59. For women, the cardiovascular fitness is considered poor if the fitness percentage value for those aged 40-49 years ranges between 21.0-24.4 or between 20.2-22.7 for those aged 50-59; moderate if the fitness percentage value for those aged 40-49 years ranges between 24.5-28.9 or between 22.8-26.9 for those aged 50-59; good if the fitness percentage value for those aged 40-49 years ranges between 29.0-32.8 or between 27.0-31.4 for those aged 50-59; and very good if the fitness percentage value for those aged 40-49 years ranges between 32.9-36.9 or between 31.5-35.7 for those aged 50-59 (Leger and Lambert, 1982).

This study has found that most respondents do not have a history of smoking. It has been discovered that smoking affects athletes' cardiovascular health. Athletes who smoke had greater maximum heart rates, resting heart rates, and recovery times than athletes who don't (Pepera and Panagiota, 2021). Malondialdehyde, a marker of peak chemiluminescence intensity, was higher in the group of athletes who smoked once a week. Catalase and superoxide dismutase levels were decreased in these athletes, confirming that the antioxidant system was functioning less effectively (Beschasnyi *et al*, 2021).

A large proportion of respondents in this study (67.65%) had a high level of physical activity. It is figured out from the questionnaire that the majority of respondents engage in a high degree of physical activity, working out on average three to six times per week. Skeletal muscles, connective tissue, and bones could suffer damage from overexertion. This injury will then cause the release of pro-inflammatory cytokines that have an impact on the liver, hypothalamic-gonadal axis, sympathetic nervous system, and central nervous system. Additionally, abnormal cardiac hypertrophy, which can result in heart failure, is linked to pro-inflammatory circumstances (da Rocha *et al*, 2019).

It was found that none of the responders had normal blood pressure. With age, the prevalence of hypertension rises. Wave reflections phenomenon cause the big arteries of elderly hypertensives to harden, which raises systolic and pulse pressures (Laurent and Boutouyrie, 2020). When stress levels were measured, it was discovered that none of the respondents fell into the category of severe stress, and that 15 respondents (44.12%) had light stress levels and 19 respondents (55.88%) had moderate stress levels. This is consistent with research finding indicating stress conditions are linked to infrequent exercise (Tomiya, 2019). The benefits of exercise are antidepressant. Reducing the signs

and symptoms of moderate to severe depression is one of the advantages of exercise.

Majority of respondents (91.18%) had normal blood glucose level. Despite the fact that the respondents were athletes, 8 (23.53%) of them were deemed overweight, and 15 (44.12%) were classified obese. An increased prevalence of CVD risk variables, including elevated body mass, dyslipidemia, systolic blood pressure, and hyperglycemia, was linked to sport-specific anthropometric demands (McHugh *et al*, 2020). Some athletes, particularly football players, have a higher than average risk of developing cardiovascular disease (McHugh *et al*, 2020).

Aerobic training of 120-150 minutes per day for 6 weeks has been proven to reduce body weight and blood glucose levels in obese competitive and recreational athletes (Arif *et al*, 2022). Exercise carried out regularly and programmed will be able to improve the athlete's body mass index and blood glucose profile, thereby reducing the athlete's risk of cardiovascular disease (De Matos *et al*, 2011). Preparticipation screening before joining exercise or competitions is still important especially to them who have bad risk of cardiovascular disease. Both professional and recreational occupations carry an increased lifetime risk of atrial fibrillation, so expanding cardiovascular screening by measuring an automated electrocardiogram (ECG) module and an echocardiogram is key to SCD prevention in athletes (Vanova *et al*, 2022).

In addition, this study found that there were no athletes with very low VO_2 max physical fitness levels. Despite the fact that PAMI athletes are a community of amateur and professional athletes, research findings indicate that not all athletes are physically fit. Professional athletes follow a more rigid training regimen than amateur athletes. Even though this has not been demonstrated in this study, this may have

an impact on blood vessel and heart health. Athletes who focus mostly on running will perform well on multistage fitness test (bleep test) and a cardiovascular fitness test. Athletes from PAMI Malang City don't all qualify as track athletes.

Three runners (25.00%), two track and field athletes (16.67%), two javelin throwers (16.67%), three soccer players (25.00%), one boxer (8.33%), and one discus thrower (8.33%) were among the 12 respondents who were professional athletes. One of the variables affecting the outcomes of the VO_2 max test is the type of exercise (Ruqayyah and Rahadianti, 2022). Sports requiring running, like soccer, reproduce higher cardiovascular fitness benefits than other sports. In our study, the athletes with runner status had the highest VO_2 max values, measuring 37.9 with a level of 7 and a shuttle of 5 from the MSFT. According to Ruqayyah and Rahadianti (2022), there is a correlation between type of sport and VO_2 max value. Athletics athletes have a greater VO_2 max value than non-athletic athletes. This is consistent with the characteristics of some sports and exercising (Torres *et al*, 2021).

The limitation of this study was the small number of samples participating in the study. It can compromise a study's validity, which raises the possibility of bias. Thus, the results of this study only described the characteristics of the study samples.

In conclusion, most of the PAMI athletes in Malang City had low level of cardiovascular risk and moderate level of physical fitness. However, there are still athletes who have high levels of stress, a history of smoking, grade 2 hypertension, hyperglycemia and obesity. This should be of particular concern to PAMI athlete trainers, in order to recommend further examination, such as preparticipation screening, especially if this happens to competitive athletes. This research has limitations because not

all PAMI athletes were involved in this study. In the future, it is hoped that similar research will be carried out on other recreational athlete communities in the city of Malang and even throughout Indonesia.

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CONFLICT OF INTEREST DISCLOSURE

All authors declare that they have no conflicts of interest.

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